Exploration of Demographic Factors that Proliferated COVID-19

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1 Introduction

Information visualization has continuously played a significant part within the logical examination and derivation of data. The explanatory visualization of information has continuously been given noteworthiness, and it can be followed from John Snow's examination of the cholera plague in 1854 [1]. By doing such analysis, the analyst was able to urge the center information to discover out from crude numbers. The later COVID-19 widespread postures modern challenges, for its exponential development and in like manner colossal financial effect [14]. This research study has utilized charts to speak to the continuous spread of the disease over different nations. This research work points to analyzing the information with the assistance of a direct relapse calculation and utilizing Python tools to portray and bring out a result by comparing the COVID-19 episode for different nations around the world. We have analyzed the dataset collected from WHO and different open Web assets. We visualized this dataset utilizing information visualization apparatuses to foresee the different parameters for the COVID-19 breakthrough. The upcoming sections of this paper will highlight upon related work in Sect. 3, methodology in Sect. 4, and Conclusion in Sect. 5. References are listed after that.

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B. Agarwal et al. (eds.), *Proceedings of International Conference on Intelligent Cyber-Physical Systems*, Algorithms for Intelligent Systems,
https://doi.org/10.1007/978-981-16-7136-4_16

2 Related Work

Troublesome circumstances like a worldwide spread can be controlled with the assistance of strength and flexibility by the individuals. The exceptional proverb of this investigation educates us as the world inundates by a few unanticipated crises, appropriately, the mindfulness of unused methods and apparatuses take the shape to foil it. All things considered, the world has confronted numerous pandemics; in any case, the spread of the COVID-19 being phenomenal in history in this way makes it diverse from other ones. In the later situation, COVID-19 estimation and analysis are a few of the foremost sought-after topics that are being investigated in much detail. A few partners evaluated the harms and conditions within the chosen time outline through distinctive approaches. Kourba [1] compared the seriousness of the COVID-19 episode with other plagues, viz., Ebola 2014, MERS 2012, and SARS 2003. He watched that the patterns of other scourges were tall at the starting, but it begins appearing as a decay after 2 months.

To defeat the pandemic by utilizing the current innovation, numerous clarifications and arrangements have been given by the specialists to get reasonable results. Khadilkar [2], Arias [3], and Karim [4] have applied control measures and imaginative innovations like Artificial knowledge and AI to restrict the impacts of the COVID-19 pandemic. Khadilkar et al. [2] have expounded the ascent of contamination rates during the lockdown and without lockdown by utilizing instruments like support learning and Arias [3] has utilized AI model and bend fitting to assess COVID-19 disease-specific regions while Karim [4] considered COVID-19 patients with the assistance of Chest X-beam pictures and propose an AI-help application that contains Deep Neural Network (DNN) in view of the programmed discovery of COVID-19 side effects followed by featuring class-separating locales utilizing slope directing strategy. Nanning Zheng et al. [5] have proposed a mixture of man-made consciousness (AI) models for COVID-19 expectation.

Test discoveries on pestilence information from a few conventional Chinese territories and urban areas show that individuals with Covid have a higher pace of disease in the third to eighth day after contamination, which is more in accordance with the plague's real transmission rules. The model's forecast results are firmly steady with genuine plague occasions, which shows that the proposed half-breed model can investigate the proliferation law and improvement example of the infection even more precisely comparated with past models, and pertinent news can additionally support the expectation model's exactness. Moreover, they have found an effective device for gauging the law of transmission just as the pattern of advancement of likely general wellbeing. Likewise, Ghosh et al. [6] have created three development models to anticipate tainted individuals throughout the following 30 days. The models like the remarkable, strategic, and SIS are the pieces of their investigation alongside the everyday pace of disease (DIR). They have dissected the outcomes all things considered from all recreations as opposed to doing it separately. They have conjectured the DIR to be zero or negative to build up the way that the COVID-19 spread has been choked. Indeed, even a little certain DIR (say 0.01) demonstrates that the infection multiplies locally. As far as having the option to pronounce a finish to the pandemic, DIR should get zero or negative for 14 days straight.

Muhammad et al. [7] have broken down the connection between the seriousness of COVID-19 and region-explicit climatic boundaries. Considering their discoveries, they inferred that the nations, which are in the low-temperature zone, have gotten a quick expansion in the COVID-19 cases in contrast with the nations situated in generally hotter climatic areas regardless of their better financial conditions. A relationship between meteorological boundaries and COVID-19 cases was likewise investigated. Normal sunlight is related to the all-out COVID-19 cases with a coefficient of assurance of 0.42, while normal high-temperature shows a connection of 0.59 and 0.42 with complete COVID-19 cases and passing cases individually. The normal temperature and sunlight hours have shown a positive connection toward the spread pace of COVID-19. Thus, territorial meteorological boundaries (mist concentrates, greatest and least temperature, day length, and so forth) are among the supporters of the quick spread of Covid in many nations of the world. Their investigation gives proof that the savagery of COVID-19 cases becomes weak when the nearby climate conditions become hotter. A large portion of the Asian nations, for example, Vietnam, Laos, Pakistan, India, and so forth, which fall under the heat and humidity, have a high temperature during May–June, bringing about a lesser number of influenced cases per million populaces. Their examination focuses on the following estimates, for example, social removing, hand washing, and long summer that help to break the chain of the COVID-19 pandemic. This investigation is valuable for policymakers and wellbeing offices in breaking the chain and understanding the quick spread of the pandemic. The outcome will likewise help the global wellbeing associations and neighborhood organizations to battle against the spread of COVID-19.

3 Methodology

For this examination, we have gathered information from 214 nations to investigate all potential reasons which can affect the spread of the COVID-19 episode around the world. We have gathered information from different open-source stages like WHO, World Population Review, WorldMeters.Info, World Climate Guide, Population Pyramid of World [8], and so forth; the information hotspots for the various boundaries utilized in our investigation are referenced in Table 1.

3.1 Demographic Parameters

The different important terminologies and parameters used in this work are explained below. Control parameters are factors that affect the COVID-19 outbreak worldwide. We have included 6 parameters for our study and analysis.

Table 1 Data sources for parameters used in the present study

Parameter	Data source
Median age	https://en.wikipedia.org/wiki/List_of_countries_by_median_age
Average temperature	https://www.climatestotravel.com/
Population density	https://worldpopulationreview.com/countries
BMI	https://en.wikipedia.org/wiki/List_of_countries_by_body_mass_index
Total Covid and death cases	https://www.worldometers.info/coronavirus/countries-where-coronavirus-has-spread/
Total population	https://www.worldometers.info/world-population/population-by-country/

1. **Body Mass Index (BMI)**

   The Body Mass Index of a person is measured as the weight of the person in kilograms divided by the square of height in meters. A high BMI is an indication of high body fat. BMI is an important tool to analyze body weight, and accordingly health issues [9]. The BMI is a simple and easy-to-understand tool to know a person's underweight, normal weight, overweight, or obeseness based on tissue mass (muscle, fat, and bone) and height. The general accepted BMI ranges are underweight (under 18.5 kg/m2), normal weight (18.5–25), overweight (25–30), and obeseness (over 30) [10]. BMIs under 20 and over 25 are associated with severe health complications and mortality too [10].

2. **Population Density**

   Population density is one of the important geographical tools, measured as the number of people residing in an area per square Kilometer. It is a measurement of population density per unit area. It is generally applied to living beings, especially human beings [11].

3. **Death Percentage**

$$Death\ Percentage = \left(\frac{No.\ of\ Death(s)}{Total\ No.\ of\ \ Infected\ Cases}\right) * 100\% \quad (1)$$

   In simple terms, it is the probability of death after getting infected.

4. **Infection Percentage**

$$Infection\ Percentage = \left(\frac{Total\ Infected\ Cases}{Total\ Population}\right) * 100\% \quad (2)$$

   In simple terms, it is the percentage of people who got infected out of the total population.

5. **Median Age**
Middle age is characterized as the age that isolates a specific populace into two mathematically similarly measured gatherings. It could be identified as a large portion of individuals are more youthful in this age and half are more seasoned. It is the single record that features the age circulation of a populace [12].

6. **Average Temperature**
The normal yearly temperature is estimated by taking the normal of the base and greatest everyday temperatures in a country during the period 1961–1990 [13]. It depends on gridded climatology, done by the Climatic Research Unit in 2011.

4 Results and Discussion

In the current examination, results have been gotten through the careful cycle directly from the start as far as possible. A dataset has been built by gathering information identified with different boundaries. This dataset has been exposed to the thorough interaction of information cleaning. We have cleaned the information utilizing NumPy. Subsequent to acquiring the cleaned dataset, we eliminated the exceptions and afterward standardized the information, to get more exact outcomes out of the dataset. The standardized dataset is then exposed to Linear Regression. At last, we have applied Linear Regression to break down our outcomes and plotted the diagram for distinct examination. The investigation is completed utilizing Python language. Its libraries like NumPy end up being valuable in information cleaning (Fig. 1).

In this examination, information of 214 nations with a sum of 71,503,614 affirmed cases and 1,612,833 passing cases has been investigated as announced until December 2020. The USA, India, and Brazil were the nations that announced the greatest number of tainted and passing cases. Our perceptions and inductions are talked about in the accompanying sub-headings.

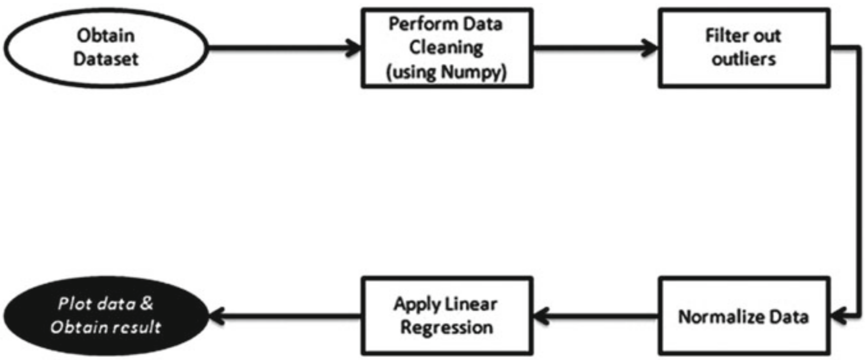

Fig. 1 Overview of methodology

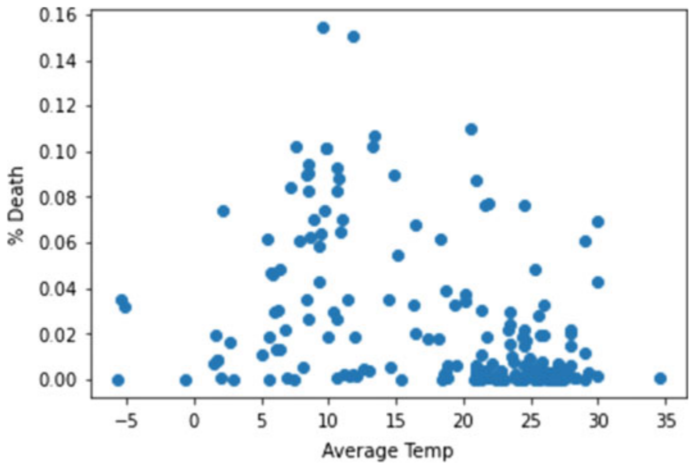

Fig. 2 Graph showing deaths versus average temperature

4.1 Deaths Versus Average Temperature

Figure 2 shows that Burkina Faso's infected percentage is (0.0189) with an average temperature (28.29 °C). Benin's infected percentage is (0.0248) with an average temperature (27.55 °C). Andorra has (9.486) infected percent with average temperature (7.6 °C) while in the case of Georgia, it is (4.8%) with an average temperature (5.8 °C).

These results suggest that an increase in COVID-19 deaths is being experienced more where the average temperature is lower, whereas its incidence is lower wherein the average temperature is higher.

The initial conclusion drawn from these observations is that the higher the temperature the lower the infection rate (lesser deaths), and the lower the temperature the higher the infection rate (higher deaths).

4.2 Death Versus Median Age

Figure 3 observed that the countries with higher median age, witnessing higher infection rates (more deaths) as compared to the countries, have lower median age. This assumption will help us to strategize better to fight against COVID-19.

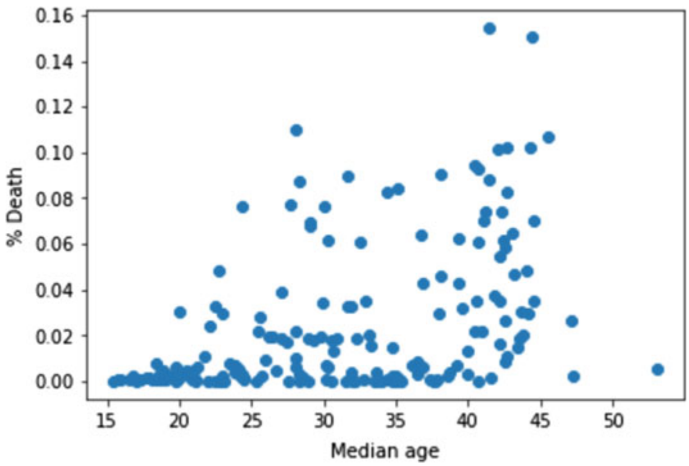

Fig. 3 Graph showing deaths versus median age

4.3 Death Versus Population Density

Figure 4 shows that Indonesia's Population Density is 151 people per km^2 while Mauritania has a Population Density of 5 persons per km^2. These two countries have vastly different population densities but still, their infection rates are almost similar at 0.224 and 0.226%, respectively. Similarly, Nicaragua's Population Density is 54 persons per km^2 whereas Saint Vincent and the Grenadines have a Population

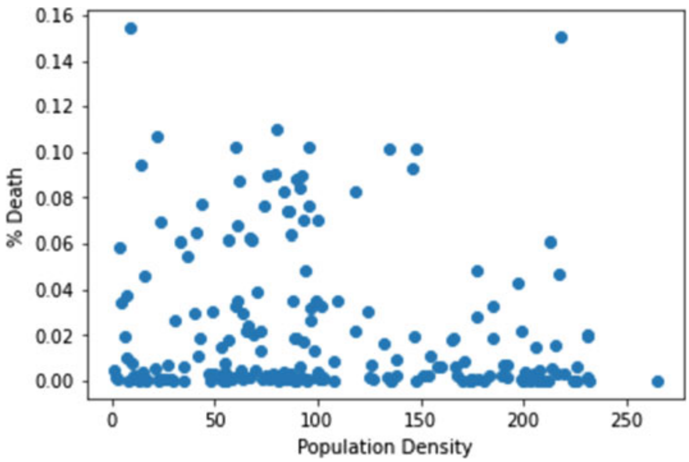

Fig. 4 Graph showing deaths versus population density

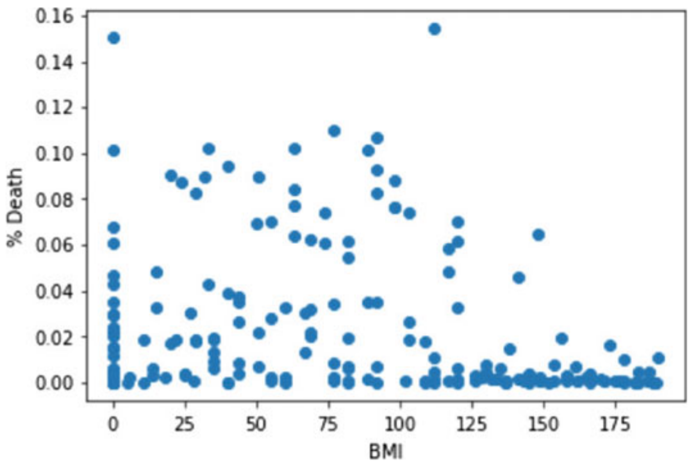

Fig. 5 Graph showing deaths versus body mass index

Density of 284 persons per km^2. These two countries have large differences in population densities but still, their infection rates are almost similar at 0.087 and 0.088%, respectively.

From the above result, it is observed that the spread of COVID-19 is independent of population density. It has also been enumerated through the graph.

4.4 Death Versus Body Mass Index

Figure 5 shows that Vanuatu has an infection percentage (0.003) with an observed Body Mass Index (BMI) (82), whereas in the case of Laos the infection percentage is (0.005) with BMI (166). To investigate further, countries like French Polynesia is having an infection percentage (5.55) with BMI (120), and Malaysia is having an infection percentage (0.25) with Body Mass Index (120). Another conclusion has been drawn with countries like Saint Lucia wherein infection percentage is (0.14) with BMI (6) and for Venezuela infection percentage is (0.37) in respect of BMI (14).

From the above observations, it has been found that there is ambiguity in the results. Thus, we can conclude that the Body Mass Index (BMI) of a person has no bearing on his Infection from COVID-19.

5 Conclusion

Results in the above section revealed that Burkina Faso's infected percentage is (0.0189) with an average temperature (28.29 °C). Benin's infected percentage is (0.0248) with an average temperature (27.55 °C). Andorra has (9.486) infected percent with average temperature (7.6 °C) while in the case of Georgia, it is (4.8) percent with an average temperature (5.8 °C). These results suggest that an increase in COVID-19 deaths is being experienced more where the average temperature is lower, whereas its incidence is lower wherein the average temperature is higher. The initial conclusion drawn from these observations is that the higher the temperature the lower the infection rate (lesser deaths), and the lower the temperature the higher the infection rate (higher deaths). Also, Indonesia's Population Density is 151 people per sq. km while Mauritania has a Population Density of 5 persons per km^2. These two countries have vastly different population densities but still, their infection rates are almost similar at 0.224 and 0.226%, respectively. Similarly, Nicaragua's Population Density is 54 persons per km^2 whereas Saint Vincent and the Grenadines have a Population Density of 284 persons per km^2. These two countries have large differences in population densities but still, their infection rates are almost similar at 0.087 and 0.088%, respectively. From the above result, it is observed that the spread of COVID-19 is independent of population density. It has also been enumerated through the graph. Vanuatu has an infection percentage (0.003) with an observed Body Mass Index (BMI) (82), whereas in the case of Laos the infection percentage is (0.005) with BMI (166). To investigate further, countries like French Polynesia is having an infection percentage (5.55) with BMI (120), and Malaysia is having an infection percentage (0.25) with Body Mass Index (120).

Another conclusion has been drawn with countries like Saint Lucia wherein infection percentage is (0.14) with BMI (6) and Venezuela whose infection percentage is (0.37) in respect of BMI (14). From the above observations, it has been found that there is ambiguity in the results. Thus, we can conclude that the Body Mass Index (BMI) of a person has no bearing on his infection from COVID-19.

This study explored the effect of temperature, median age, population density, and Body Mass Index on the fast worldwide outbreak of the COVID-19 pandemic (deaths in this pandemic). There are persuasive results from those countries with higher median age experiencing higher infection rates (more deaths) as compared to the countries having lower median age. The novel Coronavirus is convincingly lower (lesser deaths) in high-temperature zone and appears to spread faster in cooler climates. The spread of COVID-19 has no relationship in respect of Body Mass Index and population density. As future course of works, more reliable data is required to understand the behavior of COVID-19.

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